TELESCOPING AND SWIVELING HITCH ASSEMBLY

Related Application

This application claims the benefit under 35 USC 121 of United States Provisional Application No. 60/398,757 filed on July 26, 2002 in the name of Thomas S. Williams, Jr. and entitled "Telescoping and Swiveling Hitch Assembly".

Field of the Invention

The present invention relates to coupling systems for releasably interconnecting a towing vehicle with a towed vehicle and, in particular, a telescoping and swiveling hitch assembly for enabling coupling between proximately located vehicles.

Background of the Invention

Powered and trailed vehicles are conventionally interconnected for travel by coupling hitches involving fixed locations on the vehicles. Using ball and socket type universal connections or pin type connections the required relative movement during travel is provided. The fixed locations, however, are difficult to effect particularly with large vehicle that prevent ready manual alignment for final coupling. When accurate alignment is not obtained, the towed vehicle is manually moved to proper position, requiring strength, dexterity and multiple personnel, often with an attendant risk of injury. As the tongue weight of the towed vehicle increases the skills and risks are substantially increased. The problem is particularly troublesome for large steerable wheel trailers, such as employed by the military.

Telescoping and pivoting hitches have been proposed to allow coupling between misaligned vehicles. Most are designed for lighter weight trailers and unsuited for heavy load applications. Others provide only a length dependent articulation reducing the accommodated zone of vehicle misalignment.

For instance, United States Patent No. 4,515,387 to Shuck utilizes a tongue that must be fully extended before tow bar can be pivoted, thereby restricting the permissible zone of vehicle misalignment. The hitch is formed of lightweight materials not suitable for heavy trailer applications. Further, the alignment torque during retraction is borne by a sliding pin connection further reducing the ability to handle heavier trailer units. United States Patent No. 5,277,447 to Blaser also provides a telescoping hitch that is pivotal only in the fully extended position.

United States Patent No. 5,011,176 to Eppinette discloses a telescoping arm having a pivoting outer end allowing coupling to a misaligned vehicle. The towing vehicle must be moved forwardly to align the arm sections, at which time a slidable collar is placed around the pivot connection to prevent pivoting. Thereafter, the towing vehicle reversed to shift the arm to a retracted locked towing position. The need for forward movement, which is not always possible or convenient, and the multiple manual steps for achieving final coupling are disadvantageous.

United States Patent No. 5,322,315 to Carsten discloses a fixed pivot arm having a telescoping outer end mounted on the towing vehicle. After coupling, the towing vehicle must be moved forwardly for aligning and locking the pivoting arm and thereafter rearwardly for locking the

telescoping arm. United States Patent No. 6,357,779 to Mok et al. also provides a fixed pivot arm having a telescoping outer end that requires forward movement for vehicle alignment and rearward movement for retraction and locking.

United States Patent No. 6,328,326 to Slatten discloses a hitch tongue that is slidably and pivotally supported on a housing for coupling misaligned vehicles. The tongue and housing have complementary camming surfaces for nested alignment in a locked position. The camming surfaces provide limited aligning torque precluding usage on heavier trailer applications.

Brief Summary of the Invention

The present invention provides a hitch assembly suitable for heavy vehicle applications that may be readily deployed for final coupling by rough relative positioning of the vehicles. The hitch assembly comprises only two unitized subassemblies, a housing and a tow bar, that may be assembled, and disassembled for repair, using simple tools. In one aspect, the hitch assembly comprises: a housing member having an internal cavity with a restricted throat opening; an tow bar member extending into the cavity an having a tail section larger than the throat opening and establishing when engaged therewith a pivotal connection for forward aligning movement, the tow bar member being supported by said housing member for cojoint longitudinal and pivotal movement between a retracted coupled position and an extended alignment position; means for mounting the housing member on one of the vehicles; means for mounting a component of the coupling member on the tow bar member; and latching means permitting movement of the tow bar member between the coupled position and the

alignment position in a unlatched condition and fixedly connecting the tow bar member to the housing member in a latched condition; and actuating means for selectively moving said latching means between said unlatched condition and said latched condition.

The cavity has a parabolic shape characterized by widely spaced sidewalls gradually sloping inwardly from the throat and merging with a rounded base. The configuration allows substantial articulation for entire range of extension as the tow arms horizontally floats within the cavity. According, a coupling zone is provided of relatively constant width and substantial length thereby accommodating a wide range of vehicle misalignments. While the vehicles may be aligned by initial forward movement of the towing vehicle, advantageously the towing vehicle may be directly reversed to effect alignment and coupling. During initial rearward movement, the tow arm freely moves until contacting the cavity wall. Thereafter, a substantial lever arm is established with the throat providing a substantial aligning torque on the trailer tongue. As the tow arm reaches the retracted position. Nesting surfaces on the tow bar and housing coact for effecting final alignment. Whereas current military and heavy load vehicles require multiple attempts for proper vehicle placement and multiple personnel for final positioning and coupling, the present invention provides a permissible preliminary alignment zone that can be readily achieved by the vehicle operator. Moreover, either the vehicle operator or a single ground personnel, can establish the hitch coupling, with final retraction and locking accomplished with a single rearward vehicle movement.

Accordingly, it is an object of the present invention to provide a hitch assembly for interconnecting vehicles that accommodates a wide range of vehicle misalignments.

Another object of the invention is to provide a telescoping and swiveling hitch assembly for interconnecting vehicles that reduces the time, effort and personnel required to couple misaligned vehicles.

A further object is to provide a adjustable position hitch assembly that provides a constant width and substantial length zone for accommodating attachment to proximately located vehicles.

Description of the Drawings

The above and other objects and advantages of the invention will become apparent upon reading the following written description taken in conjunction with the accompanying drawings in which:

Figure 1 is a perspective view of a truck and a trailer coupled with a hitch assembly in accordance with a preferred embodiment of the invention;

Figure 2 is an enlarged perspective view of the hitch assembly in the coupled position with the truck;

Figure 3 is a side view of the truck and trailer coupled with the hitch assembly;

Figure 4 is a bottom perspective view of the hitch assembly in the extended and swiveled position at initial hookup with the truck;

Figure 5 is a top perspective view of the hitch assembly in the extended and swiveled position;

Figure 6 is a partially exploded perspective view of the hitch assembly;

Figure 7 is a perspective view of the hitch assembly;

Figure 8 is a horizontal cross sectional view of the hitch housing;

Figure 9 is a partially sectioned perspective view of the hitch assembly in the locked position; and

Figure 10 is a perspective view of the tow bar of the hitch assembly.

Description of the Preferred Embodiment

Referring to Figures 1 through 5, the present invention provides a telescoping and swiveling hitch assembly 10 for interconnecting a towing vehicle or truck 12 with a towed vehicle or trailer 14. The hitch assembly 10 is particularly adapted for heavy-duty vehicles, such as military transport systems. An exemplary towing vehicle is a Medium Tactical Vehicle Replacement (MTVR) truck and a suitable towed vehicle is a Medium Tactical Vehicle Replacement Variant trailer, both manufactured by Oshkosh Truck Corporation of Oshkosh, Wisconsin. As will become apparent, the hitch assembly may alternatively fixedly mounted on either vehicle and be releasably coupled with the other vehicle. The hitch assembly may be combined with conventional coupling configurations, such a ball and socket or pinned couplings, for accommodating relative articulating or universal movement between the vehicles. The hitch 16 on the truck 12 is conventional for MTVR truck/trailer combines and comprises a hook or pintle 18 surrounded by a protective shield 19.

The trailer 14 includes a chassis 20 supported on front and real axeled wheel assemblies 22, 23. The front wheel assembly 22 is steerable. A trailer tongue 24 includes forwardly and inwardly converging side arms 26. The side arms 26 are connected to the front wheel assembly 22 at horizontal

pivot connections 28. A cross bar 30 laterally interconnects the arms 26. The front ends of the side arms 26 are laterally spaced whereby the side arms and the cross bar 30 form a forwardly opening generally triangular slot. In commercial units a tow bar assembly is removably connected at the forward end of the side arms at the slot entrance. In the present preferred embodiment the tow bar assembly is removed for direct reception, without further modification of the trailer, of the hitch assembly 10 and using a modification of the existing hitch eyelet.

Referring to Figures 6 and 7, the hitch assembly 10 comprises two subassemblies: a housing assembly 40 and a telescoping and swiveling tow bar or probe assembly 42. The housing assembly includes a lock assembly 44. As described in greater detail below, upon release of the lock assembly 44, the probe assembly 42 has free horizontal movement and in combination with the pivoting of the trailer tongue 24 about the pivotal connections 28 permits the ready and safe coupling with a proximately located truck hitch.

The housing assembly 40 is hexagonal and configured to be received in the tongue slot of conventional MTVR trailers. The housing assembly 40 is welded or mechanically connected to the side arms 26 and cross beam 30.

The housing assembly 40 comprises a hexagonal center guide block 46, a removable triangular stop collar 48 assembled with fasteners 49, a hexagonal top cover plate 50 and a hexagonal bottom cover plate 52. Preferably, the plates 50, 52 are peripherally welded to the guide block 46 to provide a unitized assembly. A top reinforcing plate 53 is welded to the top cover plate 50 at the forward end thereof. A bottom reinforcing plate 55 is welded to the bottom cover plate 52 at the forward end thereof.

As shown in Figure 8, the guide block 46 comprises a unitary body 54 having a generally U-shaped forwardly opening cavity 56. The body 54 is exteriorally defined by forwardly inwardly converging front sidewalls 58, rearwardly inwardly converging rear side walls 60, a transverse rear wall 62 and a centrally vertically slotted front wall 64. As discussed above, the front sidewalls 58 nest with the inner surfaces of the side arms 26 of the tongue, and the rear wall 62 engages the cross beam 30 whereat the housing assembly is welded or mechanically affixed.

The cavity 56 is defined by a continuous inner wall 68 in the longitudinal center of the body 54 and comprises a U-shaped, forwardly opening parabolic base and a pair of laterally spaced, apex opposed triangular sections 70, one of which is the removable stop collar 48. With the stop collar 48 assembled with the fasteners 49 establishing a constricted frontal throat opening 72 and frontally terminating with outwardly diverging planar guide surfaces 74, forming a forwardly opening wedge shaped, tapered socket. Vertical through holes are drilled through the housing assembly and the stop collar 48 for the shanks of the fasteners 49 thereby providing for ready assembly and replacement of the collar 48. A vertical bore 76 is formed through the longitudinal center of the housing assembly 40 and the lock assembly 44 forwardly of the opening 72 for reception of the lock bolt of the lock assembly 44.

The lock assembly 44 includes a lock block 80, a lock bolt 82 having an actuating handle 84 and spring biased downwardly by a compression spring 86. The lock block 80 is a rectangular bar attached by welds to the top reinforcing plate 53 and centered over the vertical bore 76. The lock

block includes a bore extension concentric and complementary to the bore 76 and formed concurrently therewith. The lock bolt 82 is cylindrical and slidably supported in the bore 76. An inverted J-slot 90 is formed in the sidewall of the lock block 80. The inner end of the handle 84 extends through the slot 90 and connected in a counterbore in the side of the lock bolt 82. When the handle 84 resides at the base of the slot 90, the lock bolt 82 extends through the bore 76 to the bottom plates 52, 56 of the housing assembly 40 to establish a locked condition with the tow probe 42. When the handle 84 is raised to the top of the slot 90 and rotated into the side notch 91 thereof, the lock bolt 82 is in an unlocked position with the lower end thereof above the guide block 46. A cover plate 92 is connected to the top of the lock block by fasteners 94 thereby capturing and preloading the spring 88 against the top of the lock bolt 82.

Referring additionally to Figures 6, 9 and 10, the tow probe 42 comprises an elongated tow bar 100 connected to a hitch eyelet 102 by threaded nut 104. The tow bar 100 includes straight rectangular center section 106 narrower in width than the throat opening 72, an enlarged circular tail section 108 and an enlarged head section 110. When the tow bar 100 is in the fully retracted position, the tail section 108 engages the end wall of the housing cavity. When the tow bar 100 is in the fully extended position, the tail section 108 engages the walls of the collar sections 70 to establish a load bearing pivotal connection with the housing.

The head section 110 includes a base 112 having rearwardly inwardly inclined sidewalls 114 forming a tapered wedge adapted to conformally nest with the frontal walls 74 of the housing to center the tow probe 40 at and

proximate to the retracted position. A through hole 116 is formed in the base 112 and is coaxial with the bore 76 in the housing to permit movement of the lock bolt between positions.

A vertical slot 120 is formed in the center of the head section. A longitudinal bore 122 is formed in the front end of the head section and intersects the slot 120. The hitch eyelet 102 includes a cylindrical hook 130 having a vertical opening 132, a base 134 rearwardly terminating with a threaded stud 136. In assembly, the stud 136 is inserted through the hole 122 and the nut 104 threaded thereon to clamp the eyelet 102 to the probe head 110. The assembled condition is maintained by a cotter pin 140 assembled in a conventional manner through radial slots and cross holes in the nut 104 and stud 136, respectively.

It will be appreciated that the tow probe horizontally floats without fixed pivots within the confines of cavity to provide a wide zone of articulation throughout movement between the retracted and extended positions. This provides for a large strike zone for the eyelet to enable coupling with a proximately positioned pintle thereby obviating the need for tedious positioning of the towing vehicle and manual position of the trailer tongue.

As representatively shown in Figures 4 and 5, the vehicle 12 may be positioned at an angle with respect to the trailer and longitudinally separated, from a normal coupling position. To achieve coupling notwithstanding such misalignment, the handle 84 is raised in the slot 90 and rotated to the side notch 91 to provide a detented unlocked condition withdrawing the lock bolt from the tow arm. The tow probe 42 is then manually telescopically

withdrawn and the eyelet 130 coupled with the pintle hook 18. After withdrawal, the handle 84 may be releases thereby biasing the lock bolt 82 against the top surface of the center section 106

Final coupling may be accomplished in plural ways. In a direct method, the vehicle 12 may be directly backed toward the trailer. Before movement the latch handle 84 may be rotated into the slot and biased against the top surface of the tow probe. Rearward vehicle movement will drive the tow probe toward a retracted position whereat the cavity wall and opposed collar 70 are engaged thereby generating an aligning torque moving the tongue of the trailer toward longitudinal alignment with the tow bar. As the tow bar approaches the retracted position and the cavity wall become transverse to movement, the guide walls 114 of the head section 112 coact with the front walls 74 to provide a continuing aligning torque to accurately longitudinally align the tow probe in the cavity. When alignment is complete, the spring 88 biases the lock bolt through the opening 116 in the tow bar to effect without manual assistance the locked condition thereby permitting full transporting of the trailored vehicle 14.

In the indirect method, the towing vehicle 12 is moved forwardly thereby fully extending the tow probe and establishing the load bearing pivotal connection at the collar with the tail section 108. Further forward movement will establish an aligning torque on the tongue to longitudinally align the tow probe. When aligned the towing vehicle is backed until the tow probe is in the nested fully retracted position and the lock bolt actuated to the locked position.

The hitch assembly 10 may be integrated in various ways with the desired vehicle, for example by mechanical or welded attachment at the rear, or by integration into the towing tongue, or other suitable means.

Depending of the relative configuration of the housing components, a desired amount of extension and pivoting of the tow bar assembly can be provided. In actual use, a 30 inch extension with a 30 inch lateral swivel span has been successfully integrated into MTVR truck/trailer units.

Having thus described a presently preferred embodiment of the present invention, it will now be appreciated that the objects of the invention have been fully achieved, and it will be understood by those skilled in the art that many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the sprit and scope of the present invention. The disclosures and description herein are intended to be illustrative and are not in any sense limiting of the invention, which is defined solely in accordance with the following claims.